Knobbed Whelk

Busycon carica

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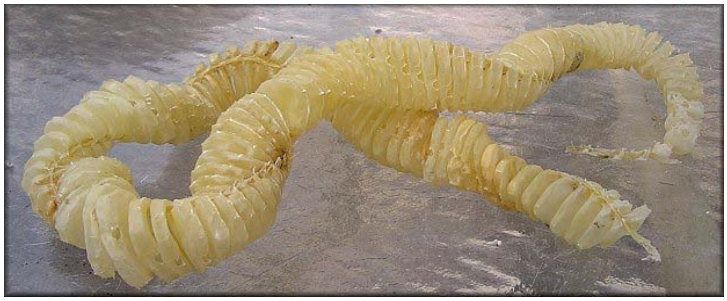
DESCRIPTION

Taxonomy and Basic Description

First described by Gmelin in 1791, the knobbed whelk, *Busycon carica,* is a member of the family Melongenidae. Whelks have flourished off of South Carolina in the Atlantic for over 30 million years. Adult whelks are usually 13 to 23 cm (5 to 9 inches) in length and characterized by low knobs on the shoulder of the whorl with the aperture on the right side. Aperture coloration ranges from light orange-yellow to brick red. The knobbed whelk is the state shell of both New Jersey and Georgia.

Although the knobbed whelk is the most common whelk in South Carolina, three other species are found in state waters in the following order of abundance: channeled whelk (*Busycotypus canaliculatus*), lightning whelk (*Busycon sinistrum*) and pear whelk (*Busycotypus spiratus*). Whelks are not to be confused with filter feeding conchs, such as the queen conch (*Strombus gigas*), found in the waters of southern Florida and the Caribbean.

The structure and coloration of knobbed whelk shells vary greatly, not only over their geographical range, but also within a locality. It is not unusual to find whelks on South Carolina beaches with different knob lengths, knob directions and aperture colors. Whelks grow by extending the shell around a central axis, producing turns, or whorls, as they evolve. The final whorl, and usually the largest, is the body whorl that terminates, providing the aperture into which the snail can withdraw. Whelks also have a separate hard, horny plate, called an operculum, which acts like a trap door when the snail withdraws into the shell. Sometimes called a "shoe," the operculum is attached to the top of the living animal's foot and is seldom found with empty whelk shells (Magalhaes 1948; Eversole and Anderson 1985).



Knobbed whelks in South Carolina lay egg strings twice a year, usually from September through October and April through May. Egg strings start to appear at times when the water temperature approximates 20 degrees C (68 degrees F). Of the two egg-laying periods, fall appears to be the most productive. It is not known if an individual female whelk contributes to both of these egg-laying peaks or if a female lays more than one string per season. However, good estimates of the average number of eggs per capsule (34 to 35) and capsules per string (100 to 120) are available for this species. Spent egg strings often wash up on beaches and consist of a series of flattened capsules attached at one end to a

tough cord or string-like structure. Some cases reach a length of over a foot and contain up to 160 capsules. In all four whelk species, eggs complete their development within the egg capsule and, after hatching, small juvenile snails emerge through a predesigned exit. The first capsules in the string usually do not contain eggs and are buried in the ocean floor as an anchor. Knobbed whelk egg capsules are coin-shaped, 20 to 30 mm (0.8 to 1.2 inches) in diameter and 3 to 6 mm (0.1 to 0.2 inches) thick with crenulations around the edges. Eggs develop slowly, hatching in about 3 to 13 months. Usually egg cases found washed up on beaches are empty with open holes that provide evidence of successful hatches. (Magalhaes 1948; Eversole and Anderson 1985).

If one finds a large knobbed whelk on the beach, chances are good it is a female. Male knobbed whelks rarely reach the large sizes of their opposite sex. Normally, female knobbed whelks have larger shells, weigh more and possess a larger foot. Whelks are thought to be protandric hermaphrodites; this means they function first as males when young, then change into females as they grow and age. This phenomenon may lead to a preponderance of females among the older and larger-sized individuals in the population (Eversole and Anderson 1985).

Whelks are carnivorous gastropods that feed on bivalves such as hard clams (*Mercenaria mercenaria*), oysters (*Crassostrea virginica*), and incongruous arks (*Anadara brasiliana*). Knobbed whelks use their shell's lip to chip and pry the valves of their prey apart by holding it with its foot so that the ventral edges of the prey's valves are under the outer lip of the whelk's shell. Slow chipping continues until an opening occurs to allow the whelk to wedge its shell between the clam's valves and then enter its foot to begin feeding. Since the feeding process results in damage to the shell, limited growth sometimes occurs in adults as energy is used to repair their shells (Carriker 1951; Magalhaes 1948)

Status

The knobbed whelk is a common species of the shallow shelf ecosystem and South Carolina estuaries. The prevalence of knobbed whelk in this habitat makes it an excellent indicator of the health of this ecosystem.

Many people enjoy collecting the deceased animal's shell. Aside from its recreational and ecological value, the knobbed whelk is targeted in the offshore whelk trawl fishery in South Carolina. Although this species is harvested, there is limited information about population trends or how whelk populations recover from commercial harvests.

POPULATION DISTRIBUTION AND SIZE

Knobbed whelks are found in east coast waters from the south shore of Cape Cod to Cape Canaveral in central Florida, with the greatest numbers occurring in southern latitudes. South Carolina is well within this species' range and it can be found throughout the state's coastal waters (Abbott 1974). Although there is no estimate of the population size of knobbed whelks in South Carolina, it appears to be an abundant and stable species.

HABITAT AND NATURAL COMMUNITY REQUIREMENTS

The knobbed whelk lives in tidal estuarine waters and offshore in depths of up to 45.7 m (150 feet), although they are more commonly found in shallow shelf waters. In estuaries, they sometimes congregate on oyster reefs and clam beds as they feed on these and other marine bivalves. Mating and spawning occurs in estuaries and offshore where egg cases are anchored to the bottom. Because knobbed whelks feed on oysters and clams, reefs are a key habitat (Magalhaes 1948).

Results of a two-year mark and recapture study indicated that whelks are very slow growing and exhibit little long-shore movement, migrating to and from estuaries only in the immediate area of their genesis (Anderson et al. 1985). Migration to and from offshore waters usually occurs throughout the year depending on water temperatures and weather conditions. During periods of winter storms, whelks will burrow into the bottom substrate and remain dormant for extended periods (Anderson et al. 1985).

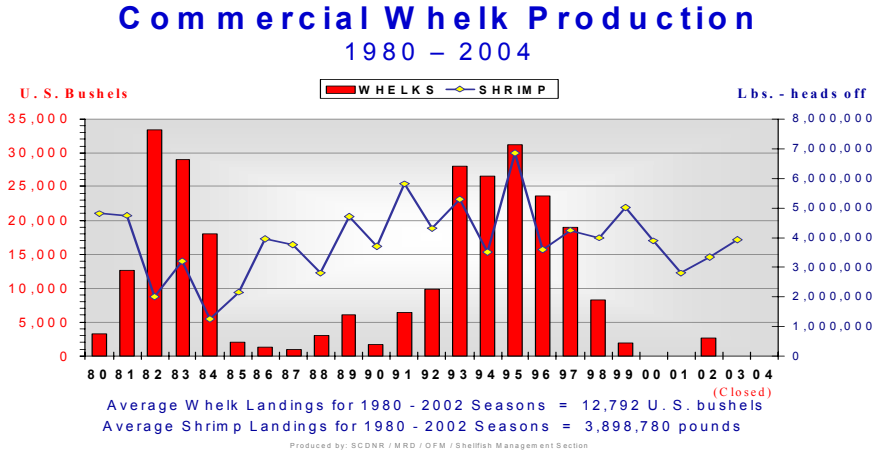
CHALLENGES

The whelk trawl fishery off the South Carolina coast evolved during 1977 and the spring of 1978 as an alternative industry to provide cash flow during periodic closure of the shrimp season. During the early 1980s, catches were shipped alive to whelk processing facilities in Mt. Pleasant and near Beaufort, South Carolina and cooked under pressure for approximately 20 minutes to break down the viscera attaching meats to the shell. Meats were extracted from the shell and then transported, on ice, to New England or blast frozen in Savannah, Georgia for markets in the Far East. Whelk meats that arrived in New England were usually processed as canned scungilli (Anderson et al. 1985).

To provide whelks the opportunity to reach sexual maturity and spawn before entering the fishery, SCDNR requires a minimum size of 10 cm (4 inches) in shell length (apex to end of siphonal canal) for harvest. However, as the siphonal canal frequently breaks during normal feeding, the minimum shell length may not always be indicative of sexual maturity. Trawling occurs from 0.8 to 4.8 km (0.5 to 3 miles) offshore. Peak production occurs in the spring as the water temperature approaches 14 degrees C (57 degrees F); this is when whelks begin moving on the bottom after a dormant period of burial. Knobbed whelks average approximately 90 percent of the catch with the remainder being channeled whelks. Currently, less than 35 commercial fishermen actively participate in the fishery with five or more trips each year, although as many as 100 permits have been issued. Peak whelk harvests occurred in 1982 and 1995 with landings of over 30,000 U.S. bushels. This was followed by two years of declining catches and four

consecutive years (1985 to 1988) of production below 4,000 U.S. bushels as the fishery collapsed. Currently, whelk harvest in state waters is limited to a total of 13,000 U.S. bushels per year (SCDNR Office of Fisheries Management 2003).

The offshore whelk fishery will likely remain cyclical based on market demand, cost of prosecuting the fishery and the capacity of fishermen to locate aggregations of whelk populations in offshore coastal waters. South Carolina has a highly regulated, short exploitation window (usually mid-February to mid-April) that is further limited by fishing gear restrictions, weather conditions, minimum whelk harvest size and marketing opportunities.



Other anthropogenic activities that may negatively impact whelk populations include oil spills, beach renourishment, and dredging. Oil spills, depending of severity, could inhibit feeding and movement out of the affected area. Whelks can be entrained in the dredge cutter, causing mortality, during beach renourishment where sand is pumped from offshore or directly from a nearby tidal creek onto the front beach. Also, pumping substrate for projects such as maintenance dredging in South Carolina harbors or the Atlantic Intracoastal Waterway causes direct mortality in a manner similar to the one describe above (pers. obs.).

CONSERVATION ACCOMPLISHMENTS

Since 1983, SCDNR has had regulatory authority over commercial whelk fisheries to set lawful fishing areas, minimum size requirements, net mesh size and opening/ closing dates for the offshore whelk trawl fishery. Currently, whelk harvesting in state waters is limited to a total of 13,000 U.S. bushels/year; this amount is believed to be a sustainable harvest. The complete closure of inshore trawling areas in 1986 has conserved the resource by reducing incidental whelk bycatch during shrimp harvest. Furthermore, a management plan for South Carolina's offshore whelk trawl fishery was developed in 1999 to provide for a more balanced, less cyclical fishery. The plan specifies closing whelk season when water temperature reaches 20°C (68°F) to prevent trawling when sea turtles are present.

CONSERVATION RECOMMENDATIONS

- Investigate the knobbed whelk's role in benthic communities, particularly as it pertains to oyster and clam populations.
- Develop an aging technique for knobbed whelk.

- Determine sex specific survivorship rates for knobbed whelk.
- Develop methods to examine long-term trends of knobbed whelk populations.
- Utilize and continue to update SCDNR's offshore whelk trawl fishery management plan.
- Determine effects of the fishery on whelk population in South Carolina.
- Continue to use whelk shells as cultch material to enhance and restore oyster reefs on public and state shellfish grounds.
- Continue SCDNR participation in Emergency Response training programs to ensure that SCDNR has the most current information on planning logistics and technology for dealing with coastal oil and hazardous material releases, as well as the most effective program to deal with the aftermath.
- Work with appropriate agencies to develop other methods of maintaining channels that do not require the use of dredging.

MEASURES OF SUCCESS

Developing a method to determine long-term population trends is one measure of success. Currently population data is collected from the whelk fishery and the number of individuals harvested may be more related to market demands than to actual population trends. In addition, by implementing the above mentioned actions to protect habitat, South Carolina will be able to promote healthy ecosystems and sustained yield of whelks.

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